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East Europe Report

SCIENTIFIC AFFAIRS

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EAST EUROPE REPORT

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CONTENTS

CEMA COOPERATION IN MICROELECTRONICS RESEARCH, PRODUCTION

East Berlin RADIO FERNSEHEN ELEKTRONIK in German No 1, 1984 p 4

[Editor's newsletter (unattributed): "CEMA Countries Create Mutual Microelectronics Basis"]

[Text] CEMA Countries Create Mutual Microelectronics Basis

An agreement concerning multilateral specialization and cooperation in the development and production of microcomponent-based products for computer technology, specialized technological equipment and highly purified materials for microelectronics was signed at the 36th CEMA Convention. Our report on this makes use of material abstracted from the newspaper DDR AUSSENWIRTSCHAFT 11 (1983) 5, p 9. The procedure for establishing the tasks for the countries involved in the specialization program is based on the traditional work areas of their corresponding combines and factories, resulting in the following assignments:

--Machine aided design methods: USSR and the People's Republic of Bulgaria

--Instrumentation and test methods: People's Republic of Hungary

--Precision optomechanics: GDR

--Assembly equipment for integrated microcircuits: People's Republic of Poland

--Equipment for processing semiconductor material: Socialist Republic of Romania

--Equipment for manufacturing LSI and VLSI circuits: USSR

--Analysis, inspection and metrology facilities: Czechoslovak Socialist Republic and GDR

Further, the countries which will coordinate the development and production of the listed products were also named. The governmental commission for the cooperative effort of the socialist countries in the field of computer technology will ensure coordination in the development and production of microelectronic products for all data processing technology equipment. Included

here is work on single-chip and single-board microprocessors, minicomputers, main-frames, very high-speed main-frames, and various peripherals.

Of special current importance is the accelerated development and transition to serial production of a family of modern competitive microprocessors based on highly integrated microcirucits. Only through careful coordination and interlacing of research and development work in the fields of microelectronics and data-processing technology is it possible to achieve the machine aided design methods and perfected technological processes required. In addition, development of the foundation for microcomponents requires the most modern special equipment and superpure materials; providing these is the focal point of the coordinated efforts of the partners. In order to more effectively structure the production of microelectronic products, a technological type process for manufacturing LSI, VLSI and special futuristic equipment was selected and ratified for the following complex areas:

--Production of semiconductor substrates

--Production of LSI and VLSI circuits on semiconductor substrates

--Mounting of integrated microcircuits in various type packages

--Control of data and test sequences of LSI and VLSI circuits

--standardized systems for machine aided design of LSI and VLSI circuits

--Production of various photographic masks and packages for LSI and VLSI circuits, cleansing and inspection of the media, etc.

The special technological equipment includes a large number of analytical, quality assurance and instrumentation devices for controlling the production of LSI and VLSI circuits. This equipment is earmarked for the production of

--Conventional, massproduced integrated and high-speed microcircuits

--LSI for microcomputers and memories, including 16- and 32-bit microprocessors

--VLSI and very high-speed integrated circuits, including matrix LSI

Accelerating the production of futuristic technological equipment deserves special attention as does also the reduction of labor intensity in the fabrication of microelectronic products and the application of new technological processes and methods which increase the functional reliability of the products. The design system under development assures the development of LSI, VLSI and photo masks by means of projection generators and coupling with the machine aided design of exchangeable blocks and type elements and of computer technology equipment. The system for machine aided design of LSI and VLSI circuits consists of equipment from the countries participating in the agreement.

9160
CSO: 2302/19

SOVIET INTEGRATED CIRCUITS IN USE IN GDR

East Berlin RADIO FERNSEHEN ELEKTRONIK in German No 11, 1983 pp 690-691

[Article by Wilfried Loeffler, B.S. (Engineering), Report from the East Berlin VEB Electronics Applications Center, adapted from paper delivered at 10th Semiconductor Components Symposium, 17-19 May 83, Frankfurt/Oder: "Integrated Circuits from the USSR"]

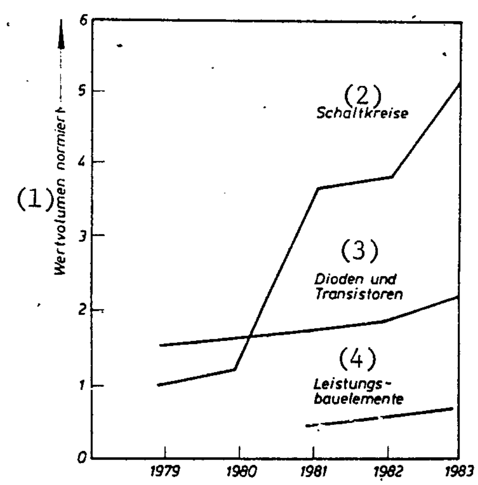
[Text] Supplementary tables of Soviet integrated circuits are presented in this article.

There is an ever greater demand to supply components from domestic production by the combines of Teltow Electronic Components, Hermsdorf and Narva Ceramics Plants and Microelectronics for research, development and production.

The GDR and USSR each currently satisfy about 40 percent of the demand for electronic components. The other 20 percent is imported from the other socialist countries.

The GDR device industry has succeeded in stepping up its rate of development with the aid of the rapidly expanded Soviet component variety and the ever increasing amounts of imports. The graph shows the growth in semiconductor component imports from the USSR relative to the value of IC imports in 1979. The perceptible increases in imports clearly illustrate the efforts which were required to compile, coordinate and confirm this assortment of electronic components.

On the other hand, there is still a considerable difference between demand by



Growth in semiconductor component imports from the USSR

Key:
1. Standardized values
2. Circuits
3. Diodes and transistors
4. Power components

the device industry and its market potential. Among other things, this stems from the desire to use modern components which are themselves still in the development or transition stages in the USSR.

For long-term, planned application preparation of the most modern components from the USSR, the assortment designated for use in the GDR was coordinated on the basis of the coordinated general directions for industry. In accordance with conditions in industry, it is made available for testing applications, use in research and development or for production.

Among others, the task of the Berlin Electronics Applications Center VEB is to inform user industries of applications for available Soviet components and to influence the use of them to the extent coordinated with the Soviet side.

As a supplement to the components made by the Microelectronics Combine VEB, about an equally large variety from the USSR is now available to GDR user industries. But it must be pointed out that they are released for use in research, development and production only when their parts have been accepted for the "electronic component lists" by the Berlin Electronics Applications Center VEB.

The following information supplements that found in [1, 2, 3].

Within the bounds of the authorized assortment, USSR imports should be relied on for all types unavailable from GDR production. Deviations from the authorized assortment are permitted only by previous approval.

K 155 Standard TTL

The types of circuits in the K 155 standard TTL family are being continually expanded. Table 1 shows the additions in this series relative to [2].

Table 1. K 155 Standard TTL

	Equivalent	Function
K 155 LE 4	SN 7427	3 NOR gates with 3 inputs each
TL 3	SN 74132	4 NAND Schmitt triggers with 2 inputs each
IV 1	SN 74148	8-to-3 priority coder
RP 3	SN 74172	16-bit RAM (8 x 2 bits) with tristate outputs
RYe 3	SN 74188	256-bit PROM (32 x 8 bits) with open collector
LP 10	SN 74365	6 bus drivers with common enable (TS)
LP 9	SN 74366	6 inverted bus drivers with common enable (TS)
LP 11	SN 74367	6 bus drivers with 2 enable inputs (TS)

K 531 Schottky TTL

Using the Schottky TTL IC's in the K 531 series (θ_a = -10 ... 70°C) allows a 2.5-fold increase in operating speed compared to TTL technology, but power

consumption is about twice as high. This series has been expanded from 23 to 45 types (see table 2).

Table 2. K 531 Schottky TTL

	Equivalent	Function
K 531 LA 7 P	SN 74 S 22	2 NAND gates each with 4 inputs and open collector
LA 6 P	SN 74 S 40	2 NAND power gates with 4 inputs each
LR 10P	SN 74 S 65	AND-NOR gate with 2x2, 1x3, 1x4 inputs and open collector
SP 1 P	SN 74 S 85	4-bit comparator
GG 1 P	SN 74 S 124	2 voltage controlled oscillators
LA 19P	SN 74 S 134	1 NAND gate with 12 inputs (tristate)
ID 7 P	SN 74 S 138	3-bit binary decoder/demultiplexer (3 to 8)
ID 14P	SN 74 S 139	two 2-bit binary decoders/demultiplexers (2 to 4)
LA 16P	SN 74 S 140	two 50-ohm NAND power drivers with 4 inputs each
KP 7 P	SN 74 S 151	1 of 8 data selector/multiplexer
IYe 16P	SN 74 S 168	synchronous programmable up/down decimal counter
IYe 17P	SN 74 S 169	synchronous programmable 4-bit up/down decimal counter
TM 9 P	SN 74 S 174	6-bit D register
TM 8 P	SN 74 S 175	4-bit D register
AP 4 P	SN 74 S 241	8 line drivers/receivers (tristate)
LYe 7 P	SN 74 S 260	2 NOR gates with 5 inputs each
IK 2 P	SN 74 S 381	ALU and function generator
IR 18P	Am 25 S 07	6 D flipflops
IR 19P	Am 25 S 08	4 D flipflops
IR 20P	Am 25 S 09	4 D flipflops
IR 21P	Am 25 S 10	4-bit shift register (tristate)
IK 1 P	Am 25 S 05	parallel multiplexer with two's complement

K 555, KM 555 Low Power Schottky TTL

Low power Schottky TTL circuits with a typical power draw of 2 mW are available for applications where low power draw is required. With the additions shown in table 3, this circuit series now has 28 types. The USSR supplies these IC's with the family designation of K 555 for θ_a = -10 to 70°C and as KM 555 for -25 ... 85°C.

Table 3. K 555 Low Power Schottky TTL

	Equivalent	Function
K 555 TL 2	SN 74LS14	6 inverted Schmitt triggers
LP 5	SN 74LS86	4 ExOR gates with 2 inputs each
KP 11	SN 74LS257	four 2 to 1 data selectors/multiplexers (tristate)
KP 14	SN 74LS258	4 inverted 2 to 1 data selectors/multiplexers (tristate)
IR 16	SN 74LS295	bidirectional 4-bit universal shift register (tristate)
KP 13	SN 74LS298	four 2 to 1 data selectors/multiplexers with storage

K 500 Emitter Coupled Logic (ECL)

This logic series, the fastest available today, is produced in the CEMA only by the USSR. Their field of application is limited, but variety is increasing here tóo; with the additions shown in table 4, there are now 49 types.

They can be used in the GDR only after previous approval by the Berlin Electronics Applications Center VEB.

Series K 500 IC's have a temperature range of $0_a = -10 \ldots 70^{o}C$.

There are three errors on page 41 of [2]. These are easily identified since the last digits in the Soviet designation are identical to those in the MC 10... series. This pertains to the following types:

K 500 LP 105 should be K 500 LP 115 (four line receivers)
K 500 LP 106 should be K 500 LP 116 (three line receivers)
K 500 LS 128 should be K 500 LP 118 (two 3-2E-OR-AND)

Table 4. K 500 Emitter Coupled Logic (ECL)

	Equivalent	Function
K 500 LP 114	MC 10114	3 difference line drivers
LP 115	MC 10115	4 difference line receivers
LP 116	MC 10116	3 difference OR-NOR line receivers
LS 113	MC 10118	2 OR-AND gates with 3 inputs each
LYe 123	MC 10123	3 bus drivers with 4, 3 and 3 inputs
TV 135	MC 10135	2 JK flipflops
RU 145	MC 10145	64-bit RAM (16 x 4 bits)
RU 148	MC 10148	64-bit RAM (64 x 1 bits)
RYe 149	MC 10149	1024-bit PROM
IYe 160	MC 10160	12-bit parity checker
IV 165	MC 10165	priority coder
KP 174	MC 10174	two 4-to-1 multiplexers
LL 210	MC 10210	2 power OR gates each with 3 inputs and 3 outputs
LYe 211	MC 10211	2 power NOR gates each with 3 inputs and 3 outputs
LP 216	MC 10216	3 difference line receivers
TM 231	MC 10231	2 D flipflops
RU 410	MC 10410	256-bit RAM (256 x 1 bits)
RU 415	MC 10415	1024-bit RAM (1024 x 1 bits)

K 561 CMOS Logic

To supplement products made by the Erfurt Radio Plant VEB, the series K 561 CMOS circuits are imported from the USSR. This series replaces the K 176.

Twelve types from this series were listed in [3]. Meanwhile, this series has been expanded considerably by USSR industry and 18 additional types have been added to the export program (see table 5).

It should be mentioned here that some users are extrapolating one type of designation of a circuit series to another; this is an unauthorized procedure. Even when this inference seems logical in some cases, an assortment cannot be expanded just because a GDR user requires a small amount of a type. Thorough preparation on a national scale is required within the responsible technical committees before a corresponding assortment expansion can be arranged within the framework of two-party cooperation with the USSR. For such cases, it is often appropriate to look for other applicable solutions to implement a user's circuit concept.

Table 5. K 561 CMOS Logic

	Equivalent	Function
K 561 IM 1	CD 4006 AE	static 18-level shift register
LA 7	CD 4011 AE	4 NAND gates with 2 inputs each
LA 8	CD 4012 AE	2 NAND gates with 4 inputs each
TM 2	CD 4013 AE	2 D flipflops
IYe 8	CD 4017 AE	decimal counter with 10 decoded outputs
IYe 16	CD 4020 AE	14-level asynchronous binary counter and divisor
LA 9	CD 4023 AE	3 NAND gates with 3 inputs each
LYe 10	CD 4025 AE	3 NOR gates with 3 inputs each
IR 9	CD 4035 AE	4-level shift register with parallel inputs and parallel outputs
LN 2	CD 4049 AE	6 inverted drivers
KP 1	CD 4052 AE	four channel difference analog multiplexer and demultiplexer
RU 2A	CD 4061 AE	256-bit RAM (256 x 1 bits)
KT 3	CD 4066 AE	4 bilateral switches
IYe 11	CD 14516 AE	preset up/down counter
SA 1	CD 14531 AE	12-bit parity checker
IP 5	CD 14554 AE	two 2-bit parallel multiplexers
IR 12	CD 14580 AE	16-bit multiport register series
IP 2	CD 14585 AE	4-bit comparator

Memory

In recent years, memory circuits have been used in modern computer, automated control and scientific hardware on a large scale. The Soviet memory IC's listed in table 6 are now available for GDR users.

Table 6. Memory

	Equivalent	Technology	Function
K 565 RU 1A	I 2107 B	nMOS	dRAM (4096 x 1 bits)
K 565 RU 2A	I 2102 A	nMOS	sRAM (1024 x 1 bits)
K 565 RU 3A	MK 4116-4	nMOS	dRAM (16384 x 1 bits)
K 573 RF 1	I 2708	nMOS	EPROM (1024 x 8 bits)
K 573 RF 2	I 2716	nMOS	EPROM (2048 x 8 bits)
KM 537 RU 1	HM 6508	CMOS	RAM (1024 x 1 bits)
K 556 RT 5	I 3604	TTL	PROM (512 x 8 bits)

Converters

The digital-to-analog converters [DAC] listed in table 7 are now available from the USSR.

The types of diodes, transistors and components of power electronics have also been considerably expanded. Changes will be published later.

Table 7. Digital eh§Plpihr Uhl''soesow

	Equivalent	Function
K 572 PA 1	AD 7250	8 ... 10-bit resolution
K 572 PA 2	AD 7545	12-bit resolution
K 594 PA 1	AD 562	12-bit resolution with input and output storage

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3. "CMOS-Schaltkreise der Reihe K 561" [Series K 561 CMOS Circuits], VEB Funkwerk, Erfurt.

8545
CSO: 2302/18

ROMANIAN COSMONAUT REPORTS ON BUDAPEST ASTRONAUTICS CONGRESS

Bucharest STIINTA SI TEHNICA in Romanian Dec 83 pp 15, 39

[Article by Lecturer Dr Eng Florin Zaganescu and Cpt Eng Cosmonaut Dumitru Prunariu: "Cooperation in Space Exploitation"]

[Excerpts] From 10 to 15 October 1983, the 34th International Astronautics Congress was held in Budapest. During this congress, ideas of great importance for future activity in this field were presented. We will present some of them in this article.

Both the exploration of cosmic space and its exploitation (especially the latter!) can be developed only on the basis of cooperation and of the peaceful use of extra-atmospheric space, for the benefit of all humanity. The space policy promoted by Romania upholds the noble idea that each people, each nation should have access to the peaceful applications and technologies of space exploration, as well as to all information obtained from the cosmos referring to its own territory. Guided by these principles the Romanian delegation to the 34th International Astronautics Congress warmly supported the motto of this prestigious international event: "Cooperation in Space".

Romania was represented by nine specialists who presented four scientific reports in the sections of astrodynamics, space law, the history of astronautics and the International Conference on Space for Students, which were highly regarded by the bureaus of the sections for their intrinsic value. Also, the Romanian cosmonaut, D. Prunariu, was greeted with joy by specialists and officials involved in the Congress, along with the other cosmonauts and astronauts from the USSR, the United States, France, Poland, Bulgaria and, of course, Hungary.

Once again, this year, the bodies involved in space exploration have placed a special emphasis on the economic effectiveness of investments in the realm of space. For example, stressing the importance of launching orbiting stations for extended extra-terrestrial cosmic flights, the Soviet academician Vladimir Alexandrovich Kotelnikov, the chairman of the "Intercosmos" Program of the Academy of Sciences of the Soviet Union, said, in one of his speeches at the Congress, that the USSR is studying the possibility of utilizing reusable space vehicles. Although this statement is not a completely new one, it shows, once again, the importance currently being given to ecomomic systems for cosmic flights, with the spaceship being one of these systems.

The importance of medical-biological research in space for the purpose of ensuring the best living and working conditions for cosmonauts during their terrestrial or even planetary orbit missions is well known. For more than 20 years there has been a wide exchange of information and opinions among Soviet and American specialists and, at the congress, the idea was launched of a joint experiment, which would take concrete form in the launching of a biological satellite, in the near future.

Prof L. Napolitano, one of the best known specialists in the field, believes that, after space telecommunications and observation of the earth from space, the manufacture of materials in space should occupy third place in the utilization of astronautics for exclusively peaceful purposes. In this framework, mention should be made of the scientific research being carried out, for the first time, on the production of interferon under conditions of the cosmos, in which the cosmonauts Farkas (from the Hungarian Peoples Republic) and Prunariu (from the Socialist Republic of Romania) collaborated, successively. This is another example of the continuity of international collaboration in applied space research, which produces results only if it is part of a long-term program.

CSO: 2702/4

BRIEFS

SEMICONDUCTOR PRODUCTION TO INCREASE--The production assortment of the Bulgarian Research and Production Combine for Semiconductor Technology in Botewgrad is to be further expanded during the 1981/85 plan period. According to information from the Federal Center for Foreign-Trade Information (BfAI), Cologne, the plan includes start up of D/S and A/D converter production. Another branch which will be further developed is optoelectronics. Presently, optical fibers and phototransistors are being manufactured in Botewgrad. Production of LEDs in superminibodies for building luminous matrices will start. A large part of the planned new development will be related to various types of integrated interface circuits. Also to be further expanded in the country's own production of bipolar linear circuits and high-power silicon transistors. [Text] [Wuerzburg ELEKTROTECHNIK in German 4 Nov 83 p 11] 9160

CSO: 3698/252

BRIEFS

LASER IRRADIATION OF METAL PARTS--The opening of a technical center for the study of laser irradiation of the surfaces of metal workpieces took place on 29 November 1983 in the GDR Academy of Sciences central institute for solid state physics and material research. This institution engages in preparations for the industrial application of laser technology which can be used to endow workpieces with higher resistance to wear. The college has at its disposal a Soviet-manufactured high performance laser which is coupled with a computerized numerical control system produced in the GDR. The control system guarantees with high precision the desired movement of the workpiece under the laser beam. The center will undertake the processing of workpiece patterns; initial application examples have been developed for this purpose along with long-term basic research. The institute also supports future application of this technology in the economy through the training of specialists from combines. [Text] [Neubrandenburg FREIE ERDE in German 30 Nov 83 p 2]

FIRST EXCIMER LASER DEVELOPED--The GDR's first excimer laser has been developed and completed after only 1 year of research work at the GDR Academy of Sciences Central Institute for Optics and Spectroscopy. The excimer laser, which consists exclusively of CEMA-manufactured components, features a simple mechanical structure and a new type of electrical thyratron control. Because of its short wavelength--it operates on the basis of xenon chloride and emits a wavelength of 308 nanometers--and its high performance, the laser is very well suited for the excitation of molecules and as a pump light source for dye lasers. The device's application potential ranges from spectroscopy to photochemistry and from materials processing to microelectronics. A GDR Academy of Sciences institute, the Humboldt University of Berlin and the Karl Marx University in Leipzig are already making use of the laser. Many additional parties have expressed interest. The development of the device in such a short period of time was made possible in part through the provision of components by the Soviet partner institute for spectroscopy in Moscow. An excimer laser is already in operation at that institute, allowing GDR experts to build on these experiences. Currently the GDR institute is working on a multi-gas variant of the laser to permit the use of several types of gas. [Text] [Halle FREIHEIT in German 6 Jan 84 p 10]

CSO: 2302/21

INSTITUTE PRODUCES PROINSULIN THROUGH GENETIC ENGINEERING

Budapest NEPSZABADSAG in Hungarian 13 Jan 84 p 5

/Article by Gabor Pal Peto: "Insulin Producing Bacteria in Szeged"/

/Text/ "Behold, as a result of 4 years work, here is that bacterium strain which produces proinsulin (the 'precursor' of insulin--the editor)," the speaker said, showing a little Petri dish in which there was a sort of green material which did not say much to the uninitiated. But the several hundred experts sitting in the large lecture hall of the Szeged Biological Center (SZBK) received the announcement enthusiastically and academician F. Bruno Straub, presiding, congratulated the "anonymous" speaker on his achievement. The speaker was anonymous in that he had reported on the achievement of a large researcher collective and so his name did not appear in the 1983 program for the SZBK Days.

A Really Widespread Disease

What is the significance of this work which was done in the Biochemistry Institute of the Szeged Biological Center of the Hungarian Academy of Sciences under the direction of Pal Venetianer, doctor of biological sciences?

Diabetes is a really widespread disease which affects many. It is incurable, but thanks to medical science those afflicted have been able, for decades, to live to a very ripe age, even capable of working, if the disease is discovered in time and if they receive insulin regularly (in certain cases). Insulin is a protein-like substance which is produced by the so-called Islets of Langerhans in the pancreas, and diabetes results from the degeneration or destruction of them; they no longer produce insulin, thus it must be supplemented.

Insulin is extracted exclusively from an animal pancreas and this causes some trouble. In the first phase for a long time the number of diabetics has been increasing more quickly than the quantity of pancreas which can be obtained from slaughter houses, thus the price of insulin is increasing world-wide. It is no smaller a problem that although pork and beef insulin is an entirely effective treatment for human diabetes there is a small difference between the insulin produced in the human organism and that extracted from animals, and this causes allergic, harmful symptoms in some humans.

These causes make it understandable that the pharmaceutical factories of the world, as soon as science discovered the technique called gene surgery or genetic engineering, immediately put on the agenda the production of insulin by this path. Although the research required large resources insulin is such a vitally important and mass marketable medicine that they did not hesitate to devote the money, time and energy to it.

The essence of gene surgery ("genetic engineering" in English) is that the material carrying the inheritable properties of humans (or animals or plants), the disoxyribonucleic acid (DNA), can in principle be manipulated in any way, and the changes will be inherited. Since insulin is a protein, the production of which is determined by a gene in the organism, if this gene could be transferred into a bacterium and there linked to its inheritance material, the bacterium would produce insulin.

But this would be too simple--there is a difference between bacteria and higher order organisms which excludes the direct transfer of this gene from man to bacteria. But in the Biochemistry Institute of the SZBK, where they have been dealing with genetic engineering for a long time, they undertook to solve the complex task, at the request of the leadership of the Academy. A copy of the RNA (ribonucleic acid) producing the insulin in the cells is "prepared" and this is called the messenger RNA. With the aid of this one can produce in an appropriate way--in a test-tube--the DNA which, linked to a so-called vector, must be put into the bacterium and made functional there.

A Tumor from Debrecen

The researchers of the SZBK worked for 3 years without result, until events suddenly accelerated in the spring of last year and barely a few days before the current SZBK Days they succeeded in producing a truly functional bacterium strain producing insulin (or, more precisely, proinsulin).

This success, which, however, is far from meaning the end of the work, was made possible by two things. One was that they had done much basic research earlier in the Biochemistry Institute, which had no "practical" result nor did it have to, but it developed the technique, the practice and the staff of experts. The other factor in the success was that earlier the work was held back by little starting material, but in the spring of last year they finally got access to sufficient material. And it was human material.

One must not think of anything bad, for it was something very good. There was a disease in the organism, in the pancreas, in the Islets of Langerhans that produce the insulin. This is very rare (there are one or two cases per year in Hungary), the essence of this is that there is an over-production of insulin, the cause of which is a benign tumor called an insulinoma. This is removed surgically. So, a Debrecen researcher, who had worked in this group in Szeged for a time, learned that such an operation was being prepared at the Debrecen Medical Sciences University and he informed his Szeged colleagues. (And here is another instructive motif from this research in addition to the importance of basic research--the utility of group work extending beyond the boundaries of scientific branches and cities.) They immediately sent a car

from Szeged to Debrecen and--in liquid nitrogen--transferred the tumor which had been taken from a patient unknown to them. (They hope that their unwitting colleague has enjoyed good health since.)

The useful tumor became the starting point for feverish work. First they extracted from it all the messenger RNA. But since a copy was prepared of the RNA of every cell the insulin one was about a 5 thousandth part of this material. Not many types of material can be separated in this form; DNA had to be prepared from each one and each one had to be put into bacteria with the aid of vectors. (They used for this purpose a bacterium favored by genetic engineers, the well known Escherichia coli.) This transfer is known professionally as cloning and the bacterium accepting the DNA linked to the vector is the clone.

So all they had to do was to separate the many thousands of types of clones, seeking those in which the DNA controlling insulin production had been included.

The First Glass of Champagne

Again the time, energy and money spent on basic research earlier, on similar experiments done on rats, paid off. The research group studied a hundred thousand bacteria colonies; 950 proved promising as a result of the first "filtering." They prepared a sort of "photograph" of each of these. (It is called an electrophoretic examination.) Then they had to study and test almost a thousand microbes individually. Finally they found 24 in which they established positively that the insulin-producing DNA was present.

"When we found the first one in June of last year, we poured the first glass of champagne," Dr Pal Venetianer said, to the no small amusement of the audience.

But the hard part of the work had only begun, because all this, though difficult and delicate, was a well-known technique; they had developed it in detail at the time of the basic research already mentioned. Now they had to see to it that the clones--that is, the bacteria--functioned, produced the proinsulin, the material from which the insulin could be produced with methods of pharmaceutical industry. (If the bacteria were to produce the insulin directly much of it would disintegrate.) Fortunately--of course, not by chance--they knew as a result of earlier work to what vector the DNA must be attached and how it must be cut--this is the real genetic engineering work--if it is to function.

"How simple!" Professor Straub said, arousing great amusement, after the talk which was received with great applause. The participants in the SZBK Days understood the fine irony. And most of those sitting in the hall suspected that much work remains to be done--here in the laboratory, for example, to increase the functioning of the clones. It is no secret that since the beginning the work was done in cooperation with the Kobanya Pharmaceutical Factory, and this factory will undertake manufacturing insulin with the aid of the Szeged bacteria or clones.

The talk by Pal Venetianer was received with such interest not only because it reported on sparkling solutions and an achievement of great importance. The entire project was instructive from, as they say, the "philosophical" viewpoint. I have referred already to the link between basic and applied research, but the collective nature of the work was exemplary also. After the many figures and formulas the leader of the group also projected the names of the group, which is unusual and was done for this reason. There were 21 of them (the work of Imre Boros, Eva Csordas Toth and Istvan Torok was singled out); one of them was from another institute of the SZBK and two were from two institutes of the Debrecen Medical Sciences University. Four medical university institutes participated in the work also (three from Szeged and one from Debrecen).

There is only one pharmaceutical factory in the world today which produces insulin with clones produced by genetic engineering and only two others are known of which are in about the position where Hungary is today. Thus we stand before great possibilities.

The '83 Days Were No Mistake

The SZBK Days 1983 end today, Friday afternoon. There were reports on many other achievements of great significance, the great majority of them by young researchers, but now these achievements can only be understood by experts. In a few years, perhaps, these will reach that stage of work now achieved by the insulin research.

But the present SZBK Days remain memorable for another reason also. It was no mistake when I wrote the 1983 SZBK Days above. This traditional series of lectures is usually held in November each year. They took place in the first days of 1984 so that the research center could salute Academician F. Bruno Straub, who recently celebrated his 70th birthday. It was he who created this research center with his energetic work and he was its first director--as the present director, Academician Lajos Alfoldi, said in his opening speech.

Short toasts and much work--this was the salute to Professor Straub.

8984
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RESOURCES DEVOTED TO PARTICLE PHYSICS RESEARCH DEEMED SCANT

Budapest MAGYAR TUDOMANY in Hungarian No 12, Dec 83 pp 885-887

/Article by Dezso Kiss, corresponding academician and deputy director of the Central Physics Research Institute: "Value of Particle Physics to Humanity"/

/Excerpt/ In Hungary experimental particle physics is dealt with only in the KFKI /Central Physics Research Institute/, within the framework of the Particle and Nuclear Physics Research Institute (RMKI), in the Particle Physics Department. A total of 18 physicists and three laboratory assistants work here. It is not easy to determine how many take part in particle physics projects in the part time available in the common shop (mechanical and electronic) representing the technical background of the institute; not more than five, according to the optimal estimate. So the total capacity is about 25 and if we include the technicians working in this area at Dubna it is about 35. Taking into consideration the population and national income of Hungary and starting proportionally from world data we could and should count on about 60-70 workers.

The annual budget of the Particle Physics Department is about 6 million forints, which includes salaries, travel costs covered from the domestic funds and the receiving of guests, and the sums intended to build equipment. One should add to this the cost of work done on the MTA /Hungarian Academy of Sciences/ computer, which is roughly 2 million forints per year, and the particle physics part of the membership fee paid into the United Atomic Research Institute in Dubna. I believe I would not be far from the truth if I put this at about one-third of the total membership fee, which is about 13 million forints. So the total per year is 21 million forints. Calculated into dollars this is about 5 cents per capita per year. This means that if the national income per capita in Hungary were as large as it is in the United States (about five times what it is at present) even then we would spend only 25 cents per capita per year on particle physics, which means that the science policy of developed countries values particle physics five times more than the domestic policy does.

It may be possible to question a "linear" comparison according to national income and size of population. It might be closer to reality if I mentioned that in the GDR there is a separate institute for particle physics research. Total personnel come to 230 persons about 90 of whom have degrees; as

compared to 25 persons here. The financial framework available is about seven times that of Hungary. Particle physics research is done in individual institutes in Austria also, and personnel and financial possibilities are comparable to those in the GDR.

On the basis of the foregoing one can draw the conclusion that humanity attributes very great significance to particle physics research and it can be expected that this will increase further in the future. The sums devoted to particle physics research are being raised now in the United States and in France to a greater degree than the expected inflation rate. (By 17 percent in the United States, while in other themes the increase is less than the inflation rate.) This clearly shows that not only the certainly prejudiced particle physicists but also the developed societies and the politicians leading them see clearly the fundamental, primary significance of particle physics despite the fact that at present it brings no practical profit. (Naturally it does have an indirect practical effect. For example, creating the large accelerating and measuring equipment often makes demands which are at or beyond the boundaries of the present technical level and thus represent a driving force in regard to raising the technical, technological, computer technology and industrial level.)

The domestic situation--as we have seen--is modest on a world scale to put it mildly. As I mentioned already, it is well known that because of the domestic science policy practice, particle physics and basic research of a nature similar to it are in a most disadvantageous situation. Despite this it must be said that domestic experimental particle physics researchers have extraordinarily good opportunities. This may appear to be a paradox, but let me note that one group of the Particle Physics Department of the KFKI will participate in one of the measurements to be done on the LEP, the new large accelerator planned to start up in 1987 by CERN, the united research institute of the western European countries. The leader of this is the American professor and Nobel Prize winner S. Ting. It is to be expected also that the United Atomic Research Institute in Dubna will participate in another large measurement planned on the LEP, the so-called DELPHI; in this case other Hungarian experimental particle physicists may join in this work through Dubna. From the viewpoint of energy and other possibilities the LEP will be the best accelerator of the coming decade. Thus our domestic colleagues will have extraordinary possibilities; by using the possibilities given by international cooperation they will be able to do very effective work on a world scale with front rank technical equipment in one of the most expensive areas of basic research, despite the fact that the domestic material and personnel background is extraordinarily unfavorable. And in the 1990's, via Dubna, we may have access to the new Soviet giant accelerator, the so-called UNK now being built, which will have record energy.

To a crucial degree all these outstanding possibilities can be attributed to the achievements, to the high quality work of domestic particle physicists. (Due to the way in which this article poses the problem it concentrates on experimental particle physics, for it is here that financial problems primarily arise. But when mentioning the achievements of domestic particle physicists one must immediately mention their theoretical colleagues many of

whom can call their own achievements which are most outstanding internationally, who are not simply "invited" into outstanding foreign institutes for long periods but who not rarely belong among those who create their "climate.") Even more important than the very good science-metric indexes (number of publications, citations, scientific degrees) is the fact that domestic experimental particle physicists have been respected participants in very successful scientific measurements and collaborations (for example, the CERN EMC, the Dubna BISZ and propane chamber, the gamma, detector, the CERN-Dubna joint NA-4, etc.), people who have been invited and eagerly are being invited into internationally high ranking laboratories for years (at their expense). There is every sign that this will be true in the future also. It gives us great pleasure that Nobel Prize winning Professor S. Ting, who recently visited our homeland, initiated the invitation of a number of experimental particle physicists to America for a long time.

In addition, particle physics is playing a pioneering role in broad scale international cooperation. International contacts are increasingly important in other areas of science also, but particle physics--because of its nature--can be cultivated only in international frameworks. (And this has its own indirect political significance also.)

What is characteristic of particle physics today in a most unique way (extraordinarily broad international cooperation, intensive and regular travel, large material expenditures, a high degree of complexity, a great division of labor within a single experiment, computerization embracing everything, experiments and publications done jointly with several hundred co-authors, experimental groups with large numbers of people, etc.) can be expected to be characteristic and typical of every area of science in the future. In this also lies the pioneering nature of particle physics.

The final conclusion is that although particle physics is one of the most expensive branches of basic research on a world scale, despite this, in a paradoxical way, it is internationally viable and competitive in Hungary even with extraordinarily modest expenditures.

Naturally, if the personnel were to increase somewhat and if the conditions of work (primarily computer capacity) were to improve to some degree, then the circle of possibilities might broaden greatly. Particle physics is the area where very serious scientific results can be achieved by the scientists of a small country with relatively small investment. On the other hand, a further deterioration of the present possibilities would mean virtually the end for the flourishing domestic experimental particle physics research--even if there is outstanding international cooperation.

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HUNGARIAN PROGRAM LANGUAGE SOLD TO BRITAIN, JAPAN, FRG

Budapest OTLET in Hungarian 5 Jan 84 p 13

[Summary] Hungarian computer technology achieved notable success at its London exhibition of latest results in personal computers and software. Organized by the foreign trade firm, METRIMPEX, it was attended by representatives of a wide variety of Hungarian institutions involved in computer hardware and software. They included SZAMALK [Computer Applications Institute], KFKI [Central Research Institute for Physics], SZKI [Institute for Coordination of Computer Technology], Comporgan, Softcoop, NOVOTRADE RT [expansion unknown] and the Computer Factory of VIDEOTON.

Dr Balint Domolky, main department head of SZKI reported that sales of MPROLOG, an advanced version of PROLOG are progressing well. An agreement was reached with the small British enterprise, LPA, which sees great potential in marketing MPROLOG. The firm believes it can sell 15-20 packages annually, a sizeable quantity for a product as perishable as software. Domolky estimates that 60,000-80,000 forints can be realized from sales and possible rentals during the first year.

According to Domolky, cooperation with the Sord firm of Japan is already in the works. Sord considers the MPROLOG language suitable for software to be sold with a fifth-generation family of microcomputers. It will be marketed in Japan exclusively. A contract with EPSILON of West Berlin has been signed which will permit unrestricted marketing, and a Canadian firm will sell MPROLOG in the USA and Canada.

The authors of MPROLOG plan to modify it so it can be run on computers having a higher capacity.

CSO: 2502/29

RADIATION TECHNIQUES IN AGRICULTURE AND FOOD INDUSTRY DESCRIBED

Budapest MAGYAR TUDOMANY No 12, Dec 83 pp 943-945

/Article by Mrs Gyorgy Bornemisza and Karoly Pasztor: "Radiation Technology Methods in Agriculture and the Food Industry"/

/Text/ The role of agriculture and food production and preservation has increased extraordinarily in the world today. So it is understandable that problems interdependent with agriculture and the food industry are receiving an ever greater role in scientific research, including physics research, and in the applications thereof. In addition to the concepts accepted long ago which have won their rights, such as agrochemistry and agrobiology, agrophysics will have ever greater significance. This concept involves the research and practical activity of a complex interdisciplinary system. One special area of agrophysics, radiation technology, is enjoying an age of dynamic changes. So it is very important to observe the development trends of themes, methods and techniques in this area, on a world scale, so that we can keep up with the changes in domestic research and practical applications. In 1979 Phylaxia organized a symposium in Budapest to review the domestic situation of radiation technology activity of an agricultural nature. After the passing of 4 years it became timely to review and evaluate this scientific area and its practical application and to debate methods for further progress. For this reason, with the participation of the Debrecen Academy Committee (DAB), the Nuclear Research Institute of the MTA /Hungarian Academy of Sciences/, the Agricultural Science Universities of Debrecen and Godollo and the Multiradiation Branch of the March 15th producer cooperative in Hernad, a two-day symposium was held 20-21 June 1983 with about 100 participants at the headquarters of the DAB with the title "Application of Radiation Technology Methods in Agriculture and the Food Industry." The 46 papers read here and the 12 posters displayed have appeared as a publication of the Nuclear Research Institute.

Academician Denes Berenyi, director of the Nuclear Research Institute of the MTA, opened the symposium on behalf of the DAB and then the opening speech was given by Janos Borsos, a deputy main department chief and chairman of the instruments committee of the Ministry of Agriculture and Food, representing the ministry.

There were two plenary speeches after the opening. In the first Professor Gyorgy Pethes reported on the most recent achievements of radioisotope techniques in the area of the veterinary sciences. Among other things he reported on the development of a radioimmune analysis (RIA) suitable for following reproduction processes of animals important from the practical viewpoint, the progesterone test, with the use of which one can increase the breeding efficiency of cattle, and on an isotope test of thyroid function. The latter is a good indication of the current level of metabolism, for example in cattle or swine, where indicating metabolic disturbances could be significant from the economic viewpoint. Finally he reported on other physical and enzyme immune methods which have spread recently. (Three posters accompanied the presentation.)

Following this Branch Chief Jozsef Simon offered a broad, complex review of problems and trends in the agricultural application of radiation technology on a domestic and world scale. Grouping the area on the basis of doses or dose output he reviewed the area from the viewpoint of biological effects (for example, the effect of stimulation treatments improving the agronomic features, increasing storage efficiency, eliciting mutations, influencing organ development, etc.), practical realization of the development of radiation equipment.

After this the lectures continued in two parallel sections. The first theme for the "A" section was "Use of Radioactive Isotopes and Tracer Techniques in Agriculture." The first lectures here described recent achievements of isotope techniques, as a continuation of classical traditions, in the acceptance of nutrients (N, P) by plants, the supply of nutrients and the movement of nutrients in the soil. In addition to recognizing the importance of ion antagonisms these experiences create a basis for more precise application of macro-nutrients contributing to the practical realization of more rational and more profitable use of artificial fertilizer. The isotope tracer method is also applicable for establishing the acceptance of herbicides and their accumulation within plants, which can not only cast light on the reasons for the differing sensitivity of various species but also can support more effective environmental protection of agrarian ecosystems.

The lectures and posters for the next theme of the section provided information about the effect of radiating seed prior to planting, improving the agronomic features, and the situation in agricultural use of stimulation. Radiostimulation not only makes it possible to increase the yields of corn, potatoes, tomatoes, etc., but also has an effect on root development, germination, the degradative enzymes of sprouts, symbiotic nitrogen fixation, the fertility of fish sperm and the development of chicken embryos. But efficient use of ionizing radiation also raises dosimetry problems demanding a determination of the optimal radiation dose taking into consideration the specific species sensitivity. Predicting the stimulation effects is necessary and useful. This is possible on the basis of a correlation of physiological features or by measuring marker enzyme activity, but an interesting new possibility is offered by a method, developed at ATOMKI /Nuclear Research Institute/, for the mass spectrometer measurement of the respiration of germinating seeds and sprouts. It is gratifying that the manufacture

(TRAKIS) and successful use (Multiradiation, March 15th producer cooperative, Hernad) of industrial scale equipment for radiostimulation of seed and seed tubers has begun domestically. There was also talk about other physical methods; for example, the germination and oil content of sunflowers can be influenced with ultrasonic treatment.

The last session of the "A" section embraced a theme titled "Studies and Practical Achievements in Radiomutation." This dealt with use of ionizing radiation aimed at plant improvement, reviewing the problems from dosimetric questions to large scale use of mutant strains. Radiomutations have been produced in a number of plant types and although some of these have found no practical use due to disadvantageous natural properties due to controllability problems, they do contribute to counterbalancing genetic erosion, as basic material for improvement with proven strains--for example, the Hungarian Nukleoryza rice neutron mutant or the Mv 8 wheat strain. The production and testing of mutations is being done in our homeland not only in rice improvement but also in the interest of improving wheat, corn, soy, lupine and linseed strains or hybrids. These studies serve not only to determine the value of the mutants but also provide useful experience for theoretical and practical improvement (for example, combinability and genetic control of yield components).

In the lively debate following the lectures the questions and comments not only offered help for the solution of or further progress in problems connected with the themes touched on but also demonstrated that the tools of radiation technology are needed to develop agricultural research and production. But the agricultural use of radiation technology is a complex interdisciplinary field in which increasing efficiency and modernization (modern methods, modelling) urgently demands the organized cooperation of various specialists. The broad use of the cyclotron being put into operation in Debrecen underscores the importance of this also.

The "B" section embraced two themes. In the opening talk of the first, "Improving Preservation, Storage and Protection Methods With Radiation Technology Procedures." Chief Director Peter Biacs reviewed achievements in this area, pointing out that for many products radiation treatment is more efficient than methods used thus far and has unique advantages (for example, in the case of onions, garlic, grain types, mushrooms, spices and meats). The harmful microorganisms are destroyed with great certainty by radiation. The effect can be controlled well by the size of the radiation dose. One can treat raw materials, foods and packaged goods and the irradiation equipment fits well into the manufacturing lines.

The second session of the section, "Dosimetry, Irradiation Equipment and Environmental Protection," reviewed domestic achievements. Special emphasis to these questions is given by the fact that the mass introduction of radiation technology methods studied under experimental and semi-operational conditions depends in large measure on the development of the irradiation capacity--at present very modest. It could represent significant progress in this area that reassuring results have been achieved in broad scale

applications experiments with use of an x-ray irradiation tunnel, an x-ray device manufactured by TRAKIS. There are plans to increase the available irradiation capacity with the aid of electron accelerator equipment of domestic design. Another new achievement is represented by the electron accelerator device whose operation has begun at the Isotope Institute of the MTA. The papers reported on these projects.

In addition to the above themes the posters showed the effect of physical or chemical treatment on yield components, agricultural application of nuclear filters, a simple method which can be applied in tracer techniques, equipment for the precise measurement of radioactive isotopes and the list of radioactive isotopes, together with their chief data, which can be produced, beginning in 1985, in the Debrecen cyclotron.

The conference gave an almost complete crossection of achievements, experiences and possibilities in the area of agriculture and the food industry in connection with use of radiation technology methods in the broad sense. One could follow the development which has taken place since 1979 in the areas of tracer techniques, irradiation for stimulation and mutation purposes, food preservation, irradiation equipment and environmental protection. In addition it called attention to other agrophysical methods also. But in addition to the achievements it became clear that the problem of coordination is not yet solved. On the basis of the above it seems justified to organize similar symposia every four years.

The headquarters of the Debrecen Academy Committee provided favorable conditions and a comfortable environment for the work of the symposium.

8984
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BIOGRAPHY OF MANAGING DIRECTOR OF INSTITUTE OF COMPUTER TECHNOLOGY, AUTOMATION

Budapest OTLET in Hungarian 5 Jan 84 p 8

[Interview with Dr Istvan Eszes by Tamas Kolossa]

[Text] The managing director of the Computer Technology and Automation Institute of the Hungarian Academy of Sciences is Dr Istvan Eszes, 32 years old, the youngest director in the country.

[Question] I think that your biography is not too long. So let us begin with that.

[Answer] I was born in Keszthely in 1951. Military service followed secondary school, then, from 1971, I studied at the "Econ" [Economics University] in Pest. I was interested in computer technology from the beginning, so I applied for the enterprise modeling branch of the economic planning and analysis section. We were among the first to study computer technology as a formal subject. At first I wanted to be in applications and it was in accordance with this that I selected the theme of my science club work and thesis. For the latter I studied water management in the Tisza and Korosok region. The upshot was that the operations were being done in a wasteful manner. I got a good grade and a prize and many pats on the back, but nothing came of it....

[Question] The typical fate of a diploma thesis....

[Answer] It still hurts. I don't want to be the thousandth and one person to criticize education but the fact is that the university atmosphere inspires a theoretical approach. There is very little opportunity to meet with everyday problems. But I always had to work, for my parents were not well off. It counted for a great deal that I was a member of the Laszlo Rajk College where, as a special requirement, they demanded regular and sensible scientific work.

[Question] What was your first job like?

[Answer] I wanted to go to the institute which was then called SZAMOK [Computer Technology Training Center] so I asked for a recommendation from a friend of the family. But he mixed up the names and I got sent to the

National Computer Statistics Office. The mistake was soon discovered but they looked at my thesis work and tested my language knowledge and gave me 48 hours to decide. I gave in and have not regretted it since. It had 30 people and I got real work on the second day; we held discussions and decided on the financing of research. We had intensive foreign contacts and I was especially happy that my knowledge of English, German, Russian and French was not wasted.

/Question/ This was not so typical. What was your initial salary?

/Answer/ I got 2,500 forints, according to the 1976 norms; I paid 1,500 forints for a sublease; with the rest I dressed, bought books, traveled and amused myself. I undertook an awful lot of extra work, programming, teaching English. Family? I did not hurry into that; I was married a year and a half ago.

/Question/ Where did you travel?

/Answer/ I wrote a part of my thesis in the FRG, for 3 months. At that time they formed an international organization of economics students through which Hungary accepted foreigners and sent out domestic students. After a thorough screening the applicants were fed into a computer at the Paris center of the organization and luckily the machine matched me with a firm in Munster where they were dealing with the computer background for the local state budget. They accepted me with misgivings; they thought I wanted to be a provocateur or spy. Later we became friends. The follow-up to this--at my place of work--was a Dutch scholarship; for 4 months I studied the computerization possibilities for industrial enterprises. This was important not only because I defended the doctoral dissertation which came from it summa cum laude but also because I got experience concerning the theme in domestic relationships also. I had to admit that many were falling victim to fashion when they got into computerization without any real weighing of the matter.

/Question/ You spent 6 years in the Central Statistics Office, and then there was the competition.

/Answer/ In August 1982 I read in the HVG /HETI VILAGGAZDASAG/ that an Academy research institute was seeking a leader with language knowledge and technical and economics expertise. I applied but then went abroad, sure of having no chance. When I returned I was surprised to find that they had been expecting me for 2 weeks. Only with the encouragement of my wife, I called SZTAKI /the Computer Technology and Automation Institute/ where--despite the delay--they were waiting for me. I went through three screenings, with some 30 colleagues. First we were interviewed by a committee consisting of leaders of the institute, then a week later by the leaders of the main office of the Academy, then we had a more relaxed talk with Academician Tibor Vamos, the leader of the institute. A week later they called me in and offered me the job of managing director. As it turned out later they had made discreet inquiries, had looked at my scientific articles, asked my former colleagues and chiefs about me. After the fact I can reveal a secret--I had an agreement with Tibor Vamos that after a year--although it applied to an indefinite time--we would give our opinion of one another and if we did not hit it off we would split. Eight months later he looked me up and said that

the year was up as far as he was concerned. This was very nice. I am happy that the competition took place so honestly, without the least "prior knowledge," because I had heard a lot about phony competitions.

/Question/ So have you given up computer technology? Have you become a "big boss" or the servant of many scientists in the good sense?

/Answer/ We have about 700 employees, 450 of them researchers. Two academicians, 9 Academy doctors, 40 candidates, nearly 100 university doctors.... My job is to create the material conditions for research even under the increasingly difficult conditions and manage in such a way that we find the optimal or at least sensitive ratio between theoretical and applied research or market sales. State support is only 20 percent of costs today so one can imagine what one has to watch and do in this trade, which is born anew day by day. So our chief effort is to sell our intellectual products as soon as possible, if there is no industrial enterprise to take them over then by creating economic associations and small undertakings. I have not given up computer technology; just now we are building up our internal small computer network. I work a lot on it at home too. I maintain on a ZX Spectrum and classify 200 cassettes and as many records; I have 60-70 game programs, etc. Am I a "big boss"? To the extent that I must demand honest, valuable or marketable work under the headline of service. Of course I do not serve the researchers personally, but rather with the aid of a large apparatus. I am learning management as a new boy; I do not lock myself up in the office.

/Question/ I know that the question is unseemly in the home of the management concept but we are not there. So, can you manage, what is your pay?

/Answer/ It is no secret, 10,500 forints. And I have excluded myself from all outside jobs. I must be satisfied with two things--my work is very interesting and I have surprising freedom in making decisions. The price--my work time is not 8 hours a day.

8984
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DEVELOPMENT OF SCIENCE, TECHNOLOGY UNDER ECONOMIC REFORM ASSESSED

Warsaw NAUKA POLSKA in Polish No 5, May 83 pp 3-14

[Text of report by Prof Dr Habilitatus B. Miskiewicz, Minister of Science Higher Education and Technology, presented at the Conference on the Status and Development of Science and Technology Under the Economic Reform, organized by the Ministry of Science, Higher Education and Technology (MNSzWiT) on 28 April 1983 in Warsaw]

[Text] The purpose of this conference is to present and discuss the main problems of the functioning of science and technology during the next few years, that is, during the period of the country's emergence from the crisis and acceleration of the economy's developmental processes. Here science and technology can and should play an essential role. Special attention will also be paid to problems of the role and tasks of science and technology under the economic reform as well as in relation to the implementation of the conservation and anti-inflation program. I believe that it would also be justified to characterize the basic directions of action of science and technology, including higher education, that ensue from the draft of the 1983-1985 National Socio-Economic Plan. Against this background I intend to present certain elements of the state's current and long-range policy on science and technology.

This conference should yield answers to the following questions:

--how can scientific-research projects be implemented as economically as possible, yet more efficiently and effectively as well, in exploiting more fully the intellectual potential of human resources in science and technology as well as funds and facilities?

--how should research programs be shaped and linkage to practice assured in order to meet society's needs and expectations, hasten the country's emergence from the crisis and participate in shaping the development directions of the economy?

--how should scientific and technological activities be oriented so that their results would find desirable practical applications while at the same time producing savings to the economy by reducing the consumption of fuels and raw and other materials, promoting exports, streamlining imports and increasing labor productivity?

These questions are not new; we have already been exploring answers to them long since. However, the country's situation makes them particularly topical and acute at present. A year ago, at the conference organized by the PZPR Central Committee, we said a great deal about the role of science and technology in helping the country emerge from its economic crisis. At the time, we had compared the resources and possibilities of science and technology with the needs of the economy. We pointed to the need to create efficient mechanisms regulating the application of innovations to the economy. Many of the issues discussed a year ago have been introduced into practice. But many others still are and should be the subject of our joint research, development and application work.

The economic reform is already being implemented in the country for more than a year. It has also been extended to science, technology and higher education. Thus the functioning of the reform in this respect merits assessment.

In the initial stage of the reform we had been dealing with a kind of protection of science and the most valuable research potential against the consequences of the crisis. At present what matters is that the most urgent social and economic tasks should be accomplished even before 1985--with the participation of the scientific community--with the aid of complete research-development-application cycles. At the same time, an attempt should be made to formulate the directions of scientific and technological development in Poland through the year 2000, in the context of the long-range needs of our country. Against this background, the principles and methods of directing the development of science and technology during the brief period through 1985 and guiding it in the long run acquire a fundamental importance.

We proceed from the premise that the current mandatory system for guiding science should be retained until 1985 while at the same time improving the system for the planning, financing and organization of R&D work. At this conference we shall focus our attention on the changes in research structure until 1985. The ultimate system requires as yet further consideration and a separate in-depth discussion.

In Poland we have a state R&D program. It comprises eight government R&D programs relating to the following topics: coal processing, copper processing, materials and subassemblies for electronics, optimization of the production and consumption of protein, housing construction, the fight against cancer, water management, and power industry. In addition, 72 principal problems, 72 interministerial basic research problems, and several ministry problems directed by various ministries are being carried out. The structure of these programs and their implementation display certain flaws, some of which I will mention.

The program comprises virtually the whole R&D field, which conflicts with the principle of concentration. In addition, there is either no linkage or fairly weak linkage of the purposes of discrete research programs to socio-economic purposes on the national scale. This contradicts the principle of the selection of research directions. As implemented so far, the principle of financing research by object has been largely reduced to financing research by

subject, with research work being scheduled over plan period rather than according to merit.

Despite its marked flaws, the current research program should be implemented until 1985, because sudden changes in research programs can produce more harm than good. The discontinuation of these programs would not only mean the direct loss of the outlays incurred so far but also a deliberate abandonment of the expected research effects. However, the verification and updating of these programs, insofar as possible, are needed, as is their revision with the object of meeting the most urgent needs of the economy. Thus while we retain the centrally guided research programs, we introduce government orders for the implementation of variable NSEP projects. By being backed by government orders, these projects acquire safeguards, higher priorities and attractive systemic preferences. The possibility of penalties for failure to implement the obligations accepted is also provided for.

The granting of special benefits and preferences is at present possible only to a fairly limited extent. Hence, the draft of the National Socio-Economic Plan (NSEP) provides for placing government orders for 104 R&D projects and 103 application projects. The selection of projects for the NSEP was performed upon broad consultation with the concerned parties and in accordance with, among other things, criteria for convergence with the plan's main aims and the magnitude of the effects intended.

Here it should be explained that government orders neither replace nor annul the R&D programs being implemented so far. They refer to selected specific projects and tasks which generally are part of particular programs. However, priority in allocating funds, providing incentives, etc. is given to the implementation of these projects and tasks, inclusive of the stage of application and achievement of the intended effects. If a government order concerns the introduction of a new type of production, the partner of the government agency in the contract or agreement will be an enterprise which will select its own appropriate co-producers. The incentives accompanying government orders include: subsidies by the state, credit guarantees and easy credit terms, eventual price surcharges for new products, facilitation of supplies, assistance with hard currencies and imports, and lastly tax relief with respect to deductions to the State Vocational Activization Fund.

Of the R&D projects included in the 1983-1985 NSEP, 25 percent pertain to food problems, 27 percent of the other topics relate to the conservation of raw and other materials and fuels and energy, 36 percent to tasks relating to the expansion of exports and rationalization of imports, and nearly 12 percent to construction, public health and environmental protection. The cost of these projects over the 1983-1985 period is estimated at about 16 billion zlotys and the cost of their application at nearly 130 billion zlotys, while their expected effects (after 1985) are estimated at more than 270 billion zlotys plus the elimination of imports worth about US$60 million.

Considering that many of the project applications require substantial investment outlays exceeding the possibilities of individual enterprises, and that these applications often transcend the scope of interests of individual

enterprises but are of special importance to the country as a whole, the draft NSEP provides for financing from central funds a few selected investments in the application of the findings of R&D work. It is assumed in this connection that they will be implemented by the procedure followed for central investments. Thirty-two such investment tasks have been specified (for implementation as of 1983) and their estimated cost will be more than 80 billion zlotys. This is the first attempt to translate into reality the long-desired principle of coordinating the planning of research, development and application work with investment activities.

In the third quarter of 1983 we intend to carry out an in-depth verification of centrally guided programs; it will be closely linked to the assumptions of the 1983-1985 Plan and take into account the assumption of the long-range plan for economic development through 1995.

It is assumed that the topics to be curtailed, postponed or eliminated will be those that are:

--difficult to schedule reliably and whose applications are difficult to anticipate;

--applicable only in the long run;

--of limited or unjustified technical or economic effectiveness;

--contingent on the implementation of investment projects that have been discontinued;

--contingent on deliveries of imported raw and other materials, subassemblies and components that have been discontinued;

--linked to individual organizations and can be financed directly by the customers;

--linked to basic research, analyses and studies whose application potential does not seem to be of the short-run kind;

--sectional, unrelated to principal purposes.

On the other hand research relating to the following topics will be expanded:

--food and nutrition;

--supplanting imported materials, subassemblies, components and facilities within the framework of the import streamlining program;

--streamlining the technology of products which enhance the profitability of production, especially production for export;

--conservation of fuels and energy;

--conservation of raw and other materials and semifinished and finished products;

--environmental protection, public health, occupational safety;

--development of highly effective, practical processes, technologies and products.

Preference will be given and research resources concentrated on topics with:

--short application schedules;

--measurable, specific effects which at the same time solve major production problems such as the shortages of raw and other materials and subassemblies, components or machinery, as well as on organizational-systemic topics intended to make production processes more flexible and enhance technical-economic effectiveness.

The state's program for scientific research during the years 1983-1985 provides for conducting basic research in the proportions and on the scale commensurate with the actual possibilities. It is expected that about 15 percent of all science and technology funds in this country will be spent on basic research. In addition, the basic research program should be specifically revised, because that research is the point of departure for applied research and development work. In this connection, the fundamental function of basic research as a prerequisite for an appropriate level of education in higher schools, as a component element of national culture and social awareness and as [a factor in] Poland's authority abroad, is appreciated.

The original research being done at higher schools and the PAN's [Polish Academy of Sciences] institutions represents a permanent and significant element of the national research system.

In recent years favorable changes have been occurring as regards the integration of research topics with the centrally guided research system as well as linking them to the scientific-research specialization of schools and other centers. Allowing for the conclusions ensuing from a review of original research and the country's current socio-economic situation, these changes should be effectively utilized for the needs of research centers and national economy and culture. In this connection, the indicated directions of original research and centrally guided basic research comprise:

--expansion of the range of futuristic interdisciplinary topics promoting the modernization of technologies, systems, products and utilization processes such as biotechnologies, unconventional energy sources and microelectronics as well as topics of significance to augmenting exports and reducing imports;

--channeling research topics in directions serving to create the scientific foundations for the continuation of applied research and development;

--utilization of basic research in the training of scientific cadres and improving the quality and enhancing the effectiveness of the educational process.

The research program being implemented with the domestic scientific research resources is complemented with foreign technology and equipment transfers. During the years 1971-1980 a total of 428 foreign licenses was acquired. Most of them were utilized in production operations. Toward the end of 1982 the number of unutilized licenses (including discontinued ones) totaled 72. Of this total; 34 are being introduced while the implementation of 38 others has been discontinued owing to investment fund restrictions. Negotiations with socialist countries are in progress with regard to cooperation in utilizing certain licenses. However, in view of the aging of Polish products and technologies and the competition on world markets, it is necessary to re-analyze the problem of the indispensable influx of the achievements of world science and technology and correlate the acquisition of licenses with the projects being undertaken in this country as well as with the expansion of post-licensing operations. A resolution of the Council of Ministers regulating these issues is being drafted.

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Poland's scientific and technological potential is inadequately exploited. Its exploitation is becoming the behest of the moment, particularly in view of the current situation (crisis, inflation).

This potential consists of:

--91 higher schools with a staff of 130,000;

--124 ministerial institutes with a staff of 70,000;

--73 institutions of the Polish Academy of Sciences with a staff of 12,000; and

--hundreds of R&D centers, plant laboratories and others.

The Three-Year Plan provides for increasing the spending on science and technology development by 30 percent in 1985 compared with 1983. The combined financial outlays on this purpose will rise from 71.1 billion zlotys in 1983 to 85.1 billion in 1985, on assuming that budget expenditures will remain at the same level (29.1 million zlotys) but the fund for technological and economic progress will be greatly increased.

To assure continuity of research in centrally guided programs and create the possibility of granting subsidies to enterprises that implement particularly important tasks, especially those covered by government orders, it has been proposed that the enterprises continue to adhere until the end of 1985 to the principle of transferring to the central fund 50 percent of their payments to the fund for technological and economic progress. The size of the funds assumed in the 1983-1985 NSEP reflects the state's actual possibilities in this field, but it also assures a proper development of science and the practical utilization of its results on condition that these funds be spent rationally and efficiently and that the principle of transferring to the central fund one-half of the deductions to the fund for technological and economic progress be retained. The other half will remain at the disposal of the enterprises.

In this context, the following problems arise:

1) The size and differentiation of deductions from the income for the value of output sold by enterprises should successively increase;

2) Centralized funding of science and technology development has to be maintained, in addition to the decentralized funding of that development by the enterprises themselves.

The draft NSEP submitted in the Parliament solves these problems for the period through 1985. The 1983-1985 Plan will be fulfilled chiefly by applying the state's economic instruments for influencing the development of science and technology.

When applying these instruments, the state's central organs should also influence science and technology by means of the direct initiation, coordination and funding of those R&D domains which transcend the scale of the interests and possibilities of individual enterprises. I refer here not just to basic research or research in non-economic domains but also to major projects for developing the economy that are of a long-range or branch-transcending scope. The state should also exercise its influence by properly guiding the R&D activities of scientific centers as well as of enterprises.

Central funds for science and technology development will be allocated for the object financing of properly verified central programs as well as for subsidizing certain research centers if so justified by the nature of their activities and accomplishments. It is also expected that financial assistance will be granted to enterprises undertaking ambitious projects for technology development. Central funds will also be spent on foreign scientific and technological cooperation initiated at the central level, scientific and technological information, and/or standardization.

The economic reform in the sphere of science has resulted in revisions of the model of the financial management of research organizations as well as in the contractual conditions between these organizations and their clients. These revisions, introduced in 1982, have in principle been extended to the present year.

Emulating the systemic regulations governing enterprises, the scope of the economic and financial autonomy of research organizations has been markedly expanded. They now have the right to determine their own financial plans, numbers of personnel and wage fund, and they decide independently on their fees in contracts with clients and enjoy broader rights to dispose of their profits as well as of part of their hard-currency income. The fund for application effects has been retained in view of its great effectiveness as a potent incentive tool.

Compared with last year's regulations, the changes introduced this year consist in:

1) increasing to 100 percent the sinking-fund credit allocated to the development fund;

2) abolishing the limit on the amount of the subsidy granted by the founding agency to the development fund.

It is for the concerned parties to assess the effectiveness and expediency of this financial system. Our observations show that it is passing its test. The work on the ultimate system for funding research activities will be completed this year and applicable regulations are to be introduced as of 1985. Allowance should be made in this connection for the statutory provisions of the scientific institutes and the Polish Academy of Sciences.

The shortage of hard-currency funds also affects the activities of many R&D organizations, higher schools and enterprises, especially those operating their own research facilities or laboratories. Trips abroad, especially for exploratory or educational purposes, are difficult to finance. There is a lack of hard currencies for importing indispensable apparatus, equipment and professional literature. Hence also exports of our own technologies, technical services and research apparatus are becoming the principal source of hard-currency income for our entire R&D base. The part of that income that can be retained will serve to finance the science and technology projects for which no funding at present is available from the central agencies.

Toward the end of last year we offered an extensive range of exports adapted to the needs of the developing countries. We also made offers to the Soviet Union, Czechoslovakia and other developing countries. We expect specific orders. But this form of action cannot be directed solely at the central level. The chief initiative here should belong to the personnel of the R&D base and the higher schools as well as scientific technologies.

We at the Ministry of Science, Higher Education and Technology have already drafted a new government resolution on the exports of scientific and technological achievements and technical services. In this draft resolution we postulate the introduction of new effective incentives, particularly economic ones, for spurring the exports of Polish scientific thought.

The centers of higher education with largest research personnel resources also are taking part in the implementation of research, development and application tasks.

The modern higher school is a school that can and does conduct the entire cycle of scientific research, from basic research to its practical applications. This is a prerequisite for a proper level of education and training. Thus, there exists an urgent need for a more efficient and fuller utilization of the human resources at higher schools with the object of a closer relationship to the needs of technology and production.

We should proceed from the premise that the scale of the research conducted at higher schools is to be markedly expanded. This concerns both research done under contracts and original research funded from the budget.

The Ordinance of 25 April 1983 of the Council of Ministers regulates the whole of financial management at higher schools and integrates within a single system all kinds of activity, including aspects of cooperation with economic organizations.

The solutions adopted with respect to cooperation with units of the socialized economy assure a flexible utilization of both central funds and the own funds of the enterprises.

It follows from the above that the activities of higher schools are financed from both the central budget funds and the outside income from contract work. The budget funds have, of course, ceilings, and they cover the following types of subsidies to the educational institution:

--for research, education and training;

--for scholarship assistance;

--for renovation;

--for investments.

The subsidies for research, education and training are also based on a specified fund for emoluments, including a ceiling on the fund for honorariums.

Educational institutions have the right to dispose of their subsidies on the purposes they deem necessary to accomplish during a given year, on the basis of the material-financial plan adopted by the institution's senate.

The contract work of the institution is financed by its clients on the basis of contracts. There are no restrictions in this respect. In this connection, the income from other projects can be used to proportionately increase the spending on emoluments, including honorariums.

It is also assumed that 50 percent of the schools' own hard-currency income can be retained by them for their own disposal.

The proposed system thus provides flexible principles for the utilization of budget funds and serves to complement them markedly with income from contract, scientific, service and production activities.

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The conservation program, which is to promote a gradual restoration of economic equilibrium in the country as well as an increase in management efficiency, poses to the technical and scientific personnel, and particularly to R&D centers and higher schools, major tasks for eliminating the waste of energy, fuels, raw and other materials and human labor. The R&D base can and should act as an inspirer in working out rational principles for the management of all production resources and especially for reducing production cost.

The principal tasks for organizations of the R&D base with regard to conserving resources in the national economy are contained in the 1983-1985 National Socio-Economic Plan.

The effectiveness of utilization of the achievements of science will be decided as enterprises as the site of their application and propagation. The readiness and ability of enterprises to introduce efficiently the achievements of science should be in this connection regarded as a major criterion of the validity of the systemic solutions of the economic reform as well as of the effectiveness of that reform's economic solutions. It is precisely the reform that should bring us closer to the solution of this difficult problem.

However, preliminary estimates which are yet to be verified--in the course of the present discussion as well--indicate that unfortunately no major improvement has yet occurred on this sector. What is more, fairly explicit disturbing symptoms of a persisting declining trend exist so far as scientific and technological innovations at enterprises are concerned.

A characteristic fact in this connection is that most of the actual innovations are of a provisional and circumstantial nature. They are chiefly small-scale and short-cycle technological projects. Extremely desirable as it is, the progress being made in intensifying and expanding production based on available resources has been too slow. Little interest is being shown in the so-called product progress (new products, quality improvements), especially when the expected effects are to benefit the product user rather than the producer.

If we disregard the temporary supply problems, the reform of the management system at enterprises has markedly increased their autonomy. However, it has not provided adequate incentives for socially rational scientific and technological progress of a broader, more long-range nature. In the present situation, particularly given the current state of the labor market and the current mechanisms of the price system, this kind of progress --mostly difficult, troublesome, costly and potentially risky--is simply not needed by enterprises and their workforces to accomplish their goal of achieving yearly profits for distribution as well as the actual level of earnings, a goal toward which they are increasingly oriented. There are much easier ways of achieving this goal.

It would be difficult--within the scope of this report--to enlarge upon this immensely complicated topic, complicated because a large number of varied conditions and factors comes into play here. Only the most general directions of counteracting these phenomena could be indicated. I would include among them the questions of:

--counteracting the monopoly tendencies in the economy;

--granting specific tax exemptions linked to technological progress and imposing tangible sanctions on costly technologies and low quality of production;

--creation of mechanisms linking the earnings of enterprise workers to the effects of progress (pro-innovation incentives promoting, in particular, cost reduction through resource-conserving technologies).

An important role in the intensification of innovative processes must be played by streamlining the flow of information between enterprises and research centers with respect to the needs and possibilities for the solution of technical problems. Another important factor is measures of a socio-psychological nature promoting the prestige and pro-innovation attitudes of the personnel on which technological progress hinges. This will be assisted by the Central Data Bank providing information on the needs of the economy and the possibilities of science, which we intend to establish. This would also be promoted by introducing a system for the evaluation of managerial personnel in which a basic criterion would be activities in behalf of innovations and their results.

A fundamental problem relating to the proper selection of research topics and more effective utilization of research findings in the national economy is a close adherence to the principle of defining research objectives (process parameters and scale, raw material requirements) with the participation of future users. This principle will be adhered to in projects done under government orders.

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We are fully aware of the unfavorable situation as regards the incomes of the personnel of research institutions compared to the general level of incomes, especially in industry. This ratio has worsened last year, thus resulting in the departure of many valuable employees. This phenomenon is particularly disturbing as regards experimental laboratories, where employment declined by 26 percent last year. I wish to state that in this connection we have undertaken energetic emergency and long-range measures.

Approval has been gained for some reductions in the amounts to be credited to the State Vocational Activization Fund. This will facilitate using the new table of maximum wages introduced by the Ministry of Labor, Wages and Social Services. Extra funding is being negotiated for the research institutions whose nature of activity is such that they cannot spare funds for wage increases. Raising the maximum individual bonus from 35 to 50 percent of base pay has been made possible. The procedure for increasing functional pay allowances for the administrators of research organizations has also been simplified.

Intensive work has been undertaken on system for remunerating all scientific personnel. It is intended to determine the proper proportions between the earnings of that personnel and the mean wages in other fields of the economy, with allowance for the high qualifications required of the personnel of research centers. This applies to all categories of employees of these centers.

Another difficult problem is providing research centers with scientific equipment. Despite the marked yearly increases in the early 1980s, the research community views the state of research facilities as inadequate. Meeting the related demand depends not only on the absolute magnitude of

resources but also on the degree of their utilization combined with accessibility and mobility of the facilities on hand. In the current economic situation precisely this latter aspect of the matter is becoming a major direction of action that produces tangible advantages.

Irrespective of the differences in assessments of the state of the research facilities of Polish science, the prevailing common view is that the available research facilities are, for various reasons, inadequately utilized. Inspections reveal numerous examples of poor management due to either negligence and a poor organization of labor or objective conditions. As a result, it happens that the useful operating time of numerous units of equipment is at most several score hours during their entire service life. Imported facilities with high technical parameters and a broad potential scope of utilization are being used for elementary measurements which could be done with the aid of more accessible and cheaper equipment. Owing to the absence of cooperation among various departments of the same organization, the organization acquires a number of identical costly facilities even though just one or two would be enough. Unused equipment stands idle for months and even years in the storerooms and workshops of many organizations.

Improving the utilization of particularly valuable equipment requires its improved deployment and operation. This depends to a large extent on the development of mutual assistance activities between higher schools and research organizations.

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No one needs be convinced that the success and pace of the application of the economic reform hinge primarily on the people who implement this process. I wish to emphasize, /implement but do not participate in it/ [printed in boldface]. Our attitude and commitment to the restructuring of the operating system of our economy and its new elements are decisive to the success of this huge undertaking.

The most topical tasks of the social sciences are the provision of convincing arguments, encouragement to think in new categories, descriptions of social relations and of the state of the awareness and economic and legal consciousness of our society as well as elevating these arguments to a level appropriate to the scale of the transformations which we must accomplish.

The economics schools and universities, together with the Supreme Technical Organization, the Polish Economics Society, the Scientific Society for Organization and Management, and other organizations shoulder the duty of undertaking the economic education of the society. We must undertake this task, because what is needed is not only understanding the nature and assumptions of the economic reform but also consolidating the conviction that only productive work can result in achieving an increase in output and distributing it fairly, thus gradually overcoming the crisis phenomena.

As part of their research, the PAN's educational institutions and institutes develop studies of various aspects of economic life, social awareness, descriptions of the reality or conditions for applying the economic reform. We realize that many of these studies do not reach a broader public. This un-

doubtedly is a waste of scientific accomplishments, a waste which we cannot afford. The gist of and data provided by these studies, intended to assist in the economic reform, and primarily their conclusions and implications, must reach the practitioners of economic life. Familiarity with the operation of the new economic system, optimal utilization of new instruments for guiding the enterprises, incentive systems raising the productivity and quality of the labor of workforces, the attainment of improved results through a more efficient organization of labor, and many other problems can be resolved in practice more rapidly and advantageously through an ongoing utilization of the effects of scientific research. Common economic problems should be a common plane of action to scientists and practitioners.

Social studies also pertain to the front of ideological struggle against the political enemy. This struggle requires thorough, scientifically justified, and effective arguments. We intend to further develop social studies, focusing effort on their quality as well as assuring their linkage to the basic problems of the practice of social life.

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The preparation of a long-range program for the development of science and technology requires linking them properly to the economic development strategy. Studies done so far point to the following determining factors in the 1980s. The first period, ending in 1985, will be characterized by raising the level of industrial and agricultural output back to where it had been before the crisis, while the 1986-1995 period will be one of restructuring the economy in accordance with the country's needs and possibilities.

The foregoing general assumptions apply to both economic and social goals. Against this background, at least four main tendencies determining the directions of research, development and application activity should be identified.

The first is the activity of science and technology in behalf of meeting the crucial socio-economic needs. One example of needed reorientation may be the re-examination of centrally guided research programs.

The second is the need for the strategic directing of R&D activity for the next 10-15 years so as to support economic and social structural transformations. This ensues from the current and anticipated situation of the country, from the possibility of a future rearrangement of development priorities. Activities in this field may be exemplified by the work already undertaken on preparing the long-range plan for the development of science and technology through 1995 and even through 2000.

The third is assuring the priority of the development of the scientific research, especially that of the basic kind, that is of special promise to future technology and engineering. Neglecting this field would, despite seeming temporary effects (e.g. resource savings) result in irreversible future damage.

The fourth is the reorientation of programs for international scientific cooperation, especially within the CEMA, and bilateral cooperation with the socialist countries, intended to improve the coordination of R&D projects and cooperation in research as well as to assure a genuine division of labor. At the same time, this concerns subordinating the cooperation programs to the solution of the most urgent problems in this country and bypassing relatively ineffective research topics that do not produce specific results.

A condition for achieving these purposes is an active and genuine (rather than seeming) participation of Poland in the international division of labor with respect to technology, particularly among the socialist countries. Nowadays, disregard or underestimation of this factor by Poland would be inconceivable. However, international division does not mean only our obtaining goods from our partners. The country has to make available an adequate number of offers and services for its partners and strive to make Polish solutions competitive in the world and represent unique specialties.

New concepts and directions of scientific research require changes in the model of [central] guidance. Irrespective of the complex process of introducing the economic reform, there exists the need to evolve a more refined system for guiding scientific research and technological development. The state's policy of guiding science and technology should have at lest four attributes:

a) assurance of central funding for scientific research;

b) provision of conditions for object- rather than subject-based funding of that research;

c) provision of possibilities for extra funding of development and application projects at enterprises;

d) promotion of the integration of the country's scientific potential.

Science and technology development requires stabilization, tranquility and rational changes in the state's scientific-technical policy as well as in directing that development and the organizations active in it. These changes should be introduced in accordance with the spirit of the reform in an evolutionary manner. This process should not concern changes in the organs of state administration; instead it should concern the essence of the problems considered.

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DOMESTIC PROGRESS IN TELEMATICS DESCRIBED

Bucharest FLACARA in Romanian 16 Dec 83 p 8

[Article by Dorin Salajan: "Telematics and the Future"]

[Excerpts] No one is surprised that there is talk about microprocessors, microcomputers, and about automatic data processing, in general and telematics, in particular. If, in the 1970's, automatic data processing reigned supreme in the world because of its absolute newness, the 1980's have also been taken over, to a large extent, by telematics and its fields. Videotex, Teletex and Telefox are fields of telematics and we can see very well that they have produced a perfect union of automatic data processing and the telecommunications system.

We learned much about these aspects by visiting some pavilions of the 1983 Bucharest International Fair. In "Pavilion A" there were several Romanian computers with symbolic names (M 118, M 126. CVB) as well as a one-dimensional VIDEOTEX or TELETEX (TTX) system. We visit the Faculty of Electronics and Telecommunications in Bucharest to get more information. A handful of young engineers and teachers, supplemented, happily, by a few students, impressed us with the honesty with which they spoke about the system which had resulted from their assiduous efforts. All in all, what had they done? They put a special decoder, an interface and a remote control system on one color television and they put an interface on another color television and it operates like an alphanumeric and graphic color display, with a Romanian microcomputer.

Pages of text, with adjacent graphics, are displayed on the screen of the color television set, presenting the most varied information from the fields of culture, history, sports, tourism, services to the population, weather news, airline schedules, etc. Videotext services are part of telematics and anyone who wants urgent information or more information in the fields mentioned can have it on the television screen (in 10 seconds). Examples of this were the more than 100 pages scanned by us on the color television screen, pages "memorized" in the external memory of a Romanian M 118 computer and new data on the television screen, at command.

Professor Constantin Serban gives us some technical details on the spot. We call up the pages we need. We satisfy our curiosity by searching through the data, parameters, block diagrams, exercises, new elements in many fields contained in the more than 100 pages.

What else can this VIDEOTEX system do? These color television sets, equipped with a videotext-type interface and remote control system, do not differ too much from an ordinary color television system. The subscriber can call up on the small screen the information which he desires. Imagine how much time we will save in researching and documenting. The computer factory and the Electronics enterprise aided in this effort. There was also much interest in the project in the National Council for Science and Technology. So, what else can the system do and what is its future?

The press and television are among the beneficiaries of the system. Let us look at the method of editing pages, the formation of data banks. We are also interested in the possibility of linkage with a television system. In regard to the near future of the system, this can be deduced from the very beginning. First of all, supplying information of the most varied types. It can be used for a multitude of broadcasts for the handicapped (persons who are deaf or hard-of-hearing), for the automation of office work, for teaching the English language, for providing subtitles for films in one language or in many languages. The important thing is that the system can be reproduced. Also, it can be produced almost exclusively with indigenous materials.

The Ministry of Posts and Telecommunications will be implementing a VIDEOTEX system on an experimental basis for 100-200 subscribers. This one-dimensional system (the information is transmitted only from the data bank to the beneficiary) can be transformed into a two-dimensional system. This is the future of the system.

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